CONFERENCE OF EMPIRE METEOROLOGISTS,
1929.

F

AGRICULTURAL SECTION.

METEOROLOGY OFFICE
2 JUN 1930

British Agricultural Meteorological Scheme.

OBSERVERS' HANDBOOK.

LONDON:
PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S STATIONERY OFFICE
BY WYMAN & SONS, LTD., FETTER LANE, LONDON, E.C. 4.

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I.—AIMS AND METHODS.

The aim of the Agricultural Meteorological Scheme is to ascertain the effect of weather on crop growth. Sufficiently detailed knowledge on this subject should prove of the utmost practical agricultural value. The following are examples of the questions on which improved advice could be given if such knowledge were available :—

The best times and methods for soil cultivation operations ;
The best systems of manuring and times of application of manures ;
Crops and their varieties best suited to given weather conditions ;
Rates and times of sowing ;
Origin of seed and treatment of seed crop ;
The best methods for tiding plants over critical periods ;
Forecasting of attacks of insect and fungous pests and measures for prevention of damage ;
Measures for the prevention of damage from harmful weather such as heavy frosts ;
The best times and methods of harvesting ;
The best times and methods of storage for securing good quality produce ;
Forecasting of yields of crops in general.

To obtain the data necessary for ascertaining the effect of weather on crop growth, schemes of observations and methods of recording such observations have been specified by the Agricultural Meteorological Committee acting for the Ministry of Agriculture and Fisheries, the Department of Agriculture for Scotland and the Meteorological Office ; and a number of stations in England, Wales and Scotland have agreed to undertake the work of recording these observations.

The records relate on the one hand to meteorological conditions and on the other to the progress and yields of agricultural and horticultural crops. To assist this scheme further, observations on wild flora and fauna have also been specified. All stations make the meteorological observations. In addition the stations make either the agricultural or the horticultural observations, or if they choose they make both. Precise observations on Wheat (Precision-Scheme) are made at certain stations in order to obtain crop data more comparable with the meteorological data than those obtained under the general scheme.

The phenological observations are optional. There are two phenological schemes ; a general scheme and a phenological gardens scheme : there is also a special phenological scheme for Wales. It is hoped, however, that the phenological gardens scheme will be adopted by stations. This scheme is distinguished from the first by the cultivation in small gardens of the plants observed, and the supply of plants by the Ministry from common stocks in order to make the observations of greater comparative value.

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It is intended, when the records of stations have been obtained in a sufficiently satisfactory form over a sufficient number of years, to subject them to rigorous statistical examination to ascertain any correlations that may exist between the different sets of data.

It is not intended thereby to prevent station observers themselves from examining their data and drawing conclusions therefrom or, indeed, carrying out such investigations with the whole of the data available under the scheme, and it is hoped, in fact, that such observers will do all they can in this direction. The whole of the data collected under the scheme will be placed freely at the disposal of any investigator willing to undertake such work.

Copies of records are carefully preserved at the stations participating in the scheme. The meteorological observations required are sent to the Meteorological Office monthly for collation; and the agricultural, horticultural and phenological observations as well as a summary of the whole of the observations are sent to the Ministry of Agriculture and Fisheries, for the like purpose.

Summaries of all the observations taken under the scheme are issued monthly by the Ministry of Agriculture and Fisheries in the "Monthly Agricultural Meteorological Report," which is supplied gratis to stations participating and to interested persons. The Report contains, in addition, references to, and reviews of, the results of agricultural meteorological research all over the world; summaries of general meteorological data for Great Britain; notes on the progress of the Agricultural Meteorological Scheme, and yearly summaries of the data collected. Biennial bibliographies are published in connection with the scheme.

The secretarial work under the scheme is carried out in the Ministry of Agriculture and Fisheries. A statistician has been engaged to examine the data from the statistical point of view. This officer is attached to the Rothamsted Experimental Station.

Particulars of the Agricultural Meteorological Committee and its Sub-Committees and of stations are given at the end of this Handbook.

An annual conference is held under the scheme at which papers are read by research workers and observers dealing with particular aspects and results of agricultural meteorological work. A full report (containing the papers and discussions) is issued of each conference and copies are circulated gratis to stations and interested persons.

The following sections contain the instructions issued to observers under the various parts of the scheme, and the forms for recording observations. The instructions have been prepared specially for the purposes of the Agricultural Meteorological Scheme. The work specified is not intended to supersede any other work carried out by stations, and observers are at liberty to add (and it is hoped they will add) any further observations they may choose.

II. METEOROLOGICAL OBSERVATIONS.

1.—OBSERVATIONS IN GENERAL.

1. The plot set aside for meteorological observations should be as near as possible to the land to be used for crop observations.

2. The following observations are required to be taken by all stations which participate in the scheme :—

Humidity and Dew Point (Dry and Wet Bulb Thermometers).
Temperature (In screen, Minimum on Grass, In soil at depths of 4 in. and 8 in.).
Wind.
Rainfall.
Sunshine.
Visibility.
Weather (Beaufort Letters).
State of ground.

3. While the following observations are not compulsory it is hoped that an attempt will be made by as many stations as possible to record them.

Maximum temperature in sun (Black bulb in vacuo).
Cloud Solar radiation.
Air pressure.
Temperature in soil at a depth of 2 ft.

4. In the use of instruments and the recording of observations, observers should follow as closely as possible the instructions given in the Meteorological Office Observers' Handbook and any subsequent instructions issued by the Meteorological Office. The special instructions given below should also be followed :—

Humidity.—The dry and wet bulb thermometers should be read at 9 h., 15 h. and 21 h.* Both dew point and relative humidity should be evaluated by the stations. Tables for the evaluation of dew point and relative humidity from the readings of the dry and wet bulb thermometers will be supplied on application to the Meteorological Office.

Temperature.—To obtain the minimum temperature on grass the thermometer should be set at 21 h., read at 9 h. next morning, then kept in the screen and set again at 21 h. The maximum temperature in the sun should be taken at 9 h.

Soil Temperature.—The observations should be taken in bare soil. The thermometers should be placed in the soil with the centre of the bulb at the required depth, the soil being disturbed as little as possible in the process and carefully replaced round the stem of the thermometer when it is in

* The times given in this Handbook relate to G.M.T., which should be used throughout the year.

position. The thermometers should not thereafter be disturbed. The bare soil area should be 2 ft. to 2 ft. 6 in. square, and the 4-inch and 8-inch thermometers should be placed about 1 ft. apart approximately at the centre of the patch (*see* Section 3 for notes on the installation of these thermometers). The 2-foot thermometer should be at the centre of a similar area. Hand removal of seedling weeds should be carried out as they appear. In the event of a snowfall, the snow should be swept away and replaced after the observations have been taken.

Observations should be taken at the following times :—

4-inch and 8-inch thermometers : readings of each thermometer should be taken to the nearest tenth of a degree F. at 9 h., 15 h. and 21 h.

2-foot thermometers : this thermometer should be read once daily at 9 h.

Wind.—If the station does not possess an anemometer, the direction and force of the wind should be estimated once daily at 9 h. Observers should obtain some preliminary practice in estimating before commencing to record observations. The Beaufort Scale should be used in recording wind force.

Stations which possess anemometers should record direction and force at 9 h., 15 h. and 21 h. When a record is missed owing to an instrumental defect estimates should be given.

It should be noted that the anemobiagraph is reliable only at wind speeds above Beaufort Force 3. At low wind speeds the instrument is apt to become insensitive to small changes owing to friction in the recording mechanism. The trace in such circumstances is a straight line or series of steps and if the observer suspects that the instrument is not working efficiently he should estimate both force and direction, making a note that this has been done when recording the observations.

The values of wind force refer to periods of 60 minutes centering at the time of observation. The mean is obtained by drawing in imagination a continuous line through the centres of narrow vertical sections of the trace and then estimating the position of a horizontal line such that the areas (between it and the continuous line mentioned) occurring above and below the horizontal line are equal. (*Note.*—This process is not equivalent to finding the horizontal line on which the centre of gravity of the inked area lies ; nor to finding the horizontal line above and below which the inked areas are equal.)

The direction is to be estimated from the direction trace in like manner. When the direction has passed through north the chart is dealt with as if the upper and lower parts of the record were continuous.

(*See* Section 4 for instructions for the care of these instruments.)

Rainfall.—Measurement should be made at 9 h.* of the previous 24 hours' rainfall.

Sunshine.—In observing sunshine duration the card must be removed after sunset and a new one substituted. Instructions for the correct orientation of the instrument and for the procedure to be followed in estimating the duration of the sunshine from the trace burnt on the card, will be found in the Meteorological Office Observers' Handbook, and should be carefully followed.

Cloud and Weather.—The Beaufort letters and international symbols should be used. The cloud observations should be taken at 9 h. The weather observations should be taken at the times indicated on the form.

Air Pressure.—The barometer and attached thermometer should be read at 9 h.

General.—The sums, means, summaries and frequency tables relating to the observations required for the minimum scheme must be worked out by observers. The mean is not required in the case of rainfall.

5. The following instruments should be used for the observations required to be taken at all stations :—

Stevenson Thermometer Screen.
Dry Bulb Thermometer.
Wet Bulb Thermometer.
Maximum Thermometer.
Minimum Thermometer.
Grass Minimum Thermometer.
Rain Gauge.
Campbell-Stokes Sunshine Recorder.
Two each Casella 4-inch and 8-inch Soil Thermometers.

The above instruments will be supplied on loan by the Ministry of Agriculture to approved stations participating in the scheme.

In the case of certain approved stations which record the horticultural crop observations the Ministry will also supply on loan a 2-foot soil thermometer and an anemobiagraph. The 2-foot soil thermometer will be of the Meteorological Office type with the bulb surrounded by wax and suspended in an iron tube.

Thermographs and self-recording 4-inch and 8-inch Soil Thermometers will be supplied on loan to all approved stations in due course.

Replacements of any of the above instruments, if damaged, will be made on application to the Ministry of Agriculture.

Arrangements will be made for an annual inspection of the instruments used at each station.

* See also later instructions in paragraph 6 dealing with the recording of observations.

6. The observations should be recorded in the first place in a notebook, Pocket Register M.O. Form 3100 adapted. They should afterwards be transferred to the forms for recording observations. In transferring figures, care must be taken to enter the observations under the day to which they relate. Thus, the 9 h. readings of the maximum in the sun and the rainfall should be recorded under the previous day.

The observations should be recorded on M.O. Forms Nos. 3203* and 3205.*

In the case of stations which already take, for the Meteorological Office, observations of all elements twice daily, and in the case of new stations which elect to observe certain elements twice daily, M.O. Form No. 3202 should be used in lieu of M.O. Form No. 3203.

Copies of these forms will be supplied on application to the Director, Meteorological Office, Air Ministry, Kingsway, W.C.2 (or Edinburgh, for Scottish stations).

The observer should complete the forms in duplicate. One set should be retained by the station ; the other set should be despatched immediately after the close of the month to The Director, Meteorological Office (M.O. 7), South Kensington, London, S.W.7 (or Edinburgh).

7. Where the observer for meteorological data is not at the same time the observer for crop, etc., data, and, therefore, does not keep the diary required from the latter, he should keep a diary on Form No. A. 174/T.G.* for the purpose of recording his impressions day by day of the type of weather in order to supplement the instrumental data. All abnormalities of weather, all spells of different kinds of weather and any discernible correlations with crop growth should be noted in the diary. The diary should be handed at the end of each month to the observer for crop data in order that he may prepare the required summary.

2.—ACCUMULATED TEMPERATURE.

It is probable that accumulated temperature affords the best means of tracing the influence of temperature on the growth of crops by statistical methods, and it has been decided that the regular compilation of temperature data in that form shall form part of the routine of all crop weather stations.

Until stations have been supplied with thermographs it will be sufficient if accumulated temperature is evaluated monthly from daily maximum and minimum temperatures by means of tables which have been prepared by the Meteorological Office. Copies of these tables may be obtained from the Ministry of Agriculture.

* See Appendix.

3.—INSTALLATION OF 4-INCH AND 8-INCH SOIL THERMOMETERS.

I.—*Right-angled Mercury-in-Glass Thermometers.*

In these thermometers a right-angled bend is introduced into the stem at such a position that when the horizontal graduated part of the stem is in contact with the ground the bulb is at the correct distance below the surface.

In installing these instruments two important points call for attention :—

(*a*) It is of great importance that the right-angled bend should be subjected to no great strain otherwise a fracture at this point is almost inevitable. Great care in installing these thermometers is, therefore, demanded.

(*b*) When installed, the soil should be replaced so that finally the information obtained from the thermometers represents as closely as possible the conditions in the undisturbed soil in the immediate neighbourhood.

The site for the thermometers should be a level piece of *bare* ground about 2 ft. 6 in. square, typical of the surrounding soil regarding which the information is desired. By means of an iron rod or auger of approximately the same diameter as the bulb of the instrument, drill two holes rather more than 4 in. and 8 in. deep, respectively. Place a little fine soil or sand at the bottom of each hole, adjusting the amount so that when the bulb, in each case, rests at the bottom of the hole, the stem is in contact with the soil. The hole should then be carefully filled in with soil. A little of the soil should then be scooped out between the horizontal part of the stem and the ground. The clear space should be not less than $\frac{1}{8}$ in. and not more than $\frac{1}{2}$ in. The instruments should not thereafter be disturbed. Seedling weeds should be removed by hand from the square plot as they appear. In the event of a snowfall, the snow should be swept away and replaced after the observations have been taken.

The two thermometers should be installed in this way separated by a distance of about 1 ft. A wire stretched between four short posts about 1 ft. high at the corners of the square may be erected round the thermometers to serve as a protection against accidental damage.

As these thermometers are very fragile, a reserve pair is issued to each station. When an instrument is broken a new instrument should be ordered as soon as possible through the Ministry of Agriculture in order to maintain the reserve.

II.—*Self-recording Mercury-in-Steel Thermometers.*

These instruments give a continuous record of the temperatures to which the bulbs are exposed, both records being obtained simultaneously on the same chart.

The recorder should be housed, to protect it from the weather, in a suitable box raised a short distance from the ground. It is necessary to use differently coloured inks to distinguish the traces made by the two pens. Violet ink should be used for the 4-inch and green ink for the 8-inch pen.

To prevent fouling, one pen should be set behind the other with regard to the time scale and a note should be made of the time interval so that a suitable correction may be made. The leading pen should always be set as near as possible to the correct time. Time marks should be put on each trace by slightly depressing the two pens at each of the regular hours of observation. The chart should be changed and the clock wound every Monday at about 9 h.

Experience has shown the advantage of keeping the lid of the clock on to prevent insects entering and stopping the mechanism. The Bourdon tubes should be watched for rust and painted if necessary. The pens should be kept clean and adjusted so that they rest very lightly on the paper, otherwise friction will be introduced and the record will be impaired.

The housing having been provided for the recorder, a trench should be dug in which to bury the thermometers and their capillary tubes. Measure the height of the base of the box above ground and subtract it from 10 ft. This gives the length of the trench to be dug backwards from the shelter. The trench should be wide enough to permit of the capillaries being 1 ft. apart and should be about 1 ft. deep, terminating at the far end in a vertical face. By means of a crowbar, make two horizontal holes 1 ft. apart, one 4 in. and the other 8 in. below the surface. They should be so made that when the crowbar is withdrawn the bulbs of the thermometers can be thrust in horizontally to their full length. This ensures that the bulbs will be in practically undisturbed soil. Fill in the trenches, taking care to keep the capillaries horizontal, straight and uniformly supported.

The ultimate position of the bulbs should be approximately at the centre of a bare soil plot about 2 ft. 6 in. square.

To check the indications of the recording thermometers, ordinary 4-inch and 8-inch bent-stem soil thermometers should be installed near the bulbs. These should be read at 9 h., 15 h. and 21 h. each day, the observations being entered on M.O. Form No. 3205 as well as on the chart. Further instructions will be issued regarding the tabulation of the records.

4.—CARE OF ANEMOBIAGRAPHS.

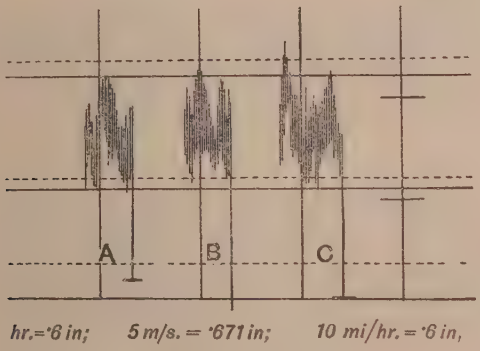
Daily Routine.

To Change the Chart.

(1) Close both stop-cocks and note the time to the nearest minute.

(2) Allow the velocity pen to come to rest without touching it, but if the air is calm, raise the float slightly and allow it to fall so that a vertical time mark is produced by the velocity pen.

(3) Rotate the clock cylinder slightly, so that the velocity pen marks its resting position upon the chart (*see* instances at A, B and C in figure below).



(4) Swing back the velocity pen and hold back the direction pen from the paper, remove the screw of the clock spindle and lift off the clock cylinder.

(5) Remove the completed chart from the clock cylinder and wind the clock.

(6) Insert a blank chart in position taking care that :—

(*a*) the new chart be not folded, creased or crumpled in any way.

(*b*) the ends of the two long horizontal lines which are carried to the edges of the chart overlap.

(*c*) the bottom edge of the chart is as close to the flange on the clock cylinder as (*b*) allows. It should touch it at one point at least. If the bottom edge is not cut exactly parallel to the horizontal lines on the chart, it will not be possible to place it on the cylinder so that the edge touches the flange throughout its length.

(*d*) the paper fits closely to the cylinder without cockling or creasing.

(7) Put back the clock cylinder and replace the screw on the spindle.

Adjustment of Pens.

(8) Fill the pens with ink after seeing that they are clean. If they are not, lift them out of their sockets and wash them. A new pen may give trouble in starting but can be made to mark freely if it is first held in the flame of a match for a second or two, care being taken to wipe off any soot that may be deposited on the pen.

(9) Swing the pens into contact with the paper, avoiding any splashing of ink.

(10) If necessary, adjust the velocity pen to fall exactly on the zero line of the velocity record by means of its socket screw. (*See* C in figure above.)

(11) Large sudden movements of the direction lever are damped by a plunger working in a dash-pot of oil. See that there is sufficient oil in the dash-pot. Medium lubricating oil is suitable for the purpose.

Starting the Record.

(12) Set the clock cylinder so that the pens indicate a time on the chart a little later than the correct time. Now, by one steady movement, turn the cylinder on its spindle in an anti-clockwise direction until the pens indicate the time to the nearest minute. A few trials will make this clear and will also show that unless this method is strictly followed, the clock cylinder does not begin to rotate (owing to backlash) for some minutes, resulting in a loss of time on the record.

(13) Open both stop-cocks. If the air is calm, raise the float slightly and allow it to fall again so that a vertical time mark is produced by the velocity pen.

(14) See that all the pens are marking.

Time Mark.

(15) A time mark should be made on the record, preferably within two or three hours of the start of the record. The mark is made by closing both taps so as to allow the pen to fall to the zero line of the record. The taps should then be opened again. The time, to the nearest minute, should be noted at the time the mark is made, and this should be entered on the chart, in the space provided, after it has been removed from the cylinder.

If the air is calm, this time mark should not be made. In no circumstances should the pen be raised by hand for the purpose of making this mark.

Writing up the Chart.

(16) Number the chart with the day of the year as given in the Meteorological Office Calendar.

(17) Enter name of station, date, month and year, also the time at which the chart was started and stopped, and the time of the time-mark described under (15).

(18) Write upon the front of the chart any known explanation of abnormal features, e.g., failure to mark, clock stopping, etc.

General Remarks.

Cleanliness.—The observer should give the utmost attention to general cleanliness. Ink should not be allowed to encrust the underside of the pens or the pen holders. Drops of ink that may fall upon the top of the tank or trickle down the chart to the clock cylinder flange should be cleaned off at once. To prevent sticking of the velocity pen, the float rod must be kept clean and dry. NO METAL POLISH OR LUBRICATING OIL OR CLEANING MATERIAL SHOULD BE USED, but it is beneficial to rub the rod with a piece of blotting paper previously treated with lead pencil.

Liquid Level.—The liquid used is a mixture of glycerine and water having a specific gravity of 1·16. The float chamber is filled with this liquid until the top of the pointer in the gauge glass is just on the surface of the liquid, when both stop-cocks are turned off. The instrument itself should be level before the liquid is poured in. More liquid can be added through the gauge glass and any excess can be run out by undoing the screw which releases the draining plug under the glass. A special funnel for filling purposes is supplied, but if this is not available an ordinary small glass funnel fitted with a short length of rubber tubing will do as well.

Water Trap.—The small water trap, which is inserted in the suction tube, serves to collect any water which may be driven into the suction holes of the head and find its way into the float chamber, thereby altering the specific gravity of the liquid therein. This trap should be emptied frequently.

Renewing Pens.—A new pen is easily placed in its grip sleeve. See that the distance from the pen point to the little grip sleeve is as nearly as possible the same as with the old pen or it will need further adjustment. When looked at from above the pen should appear to be at right angles with the paper. See that the new pen agrees with the other pens in regard to time—that is, they must all fall simultaneously upon the same vertical hour line.

Orientation.—The indication of the direction recording pen should be checked from time to time against the actual direction of the vane. To carry out the test, it will be necessary to ascend the

mast on a calm day and sight the vane on an object whose bearing is accurately known. If necessary, adjust the direction pen to the proper reading by slackening off the screws through the slotted connector, turning the helix until the right direction is indicated and then tightening up the connector screws again. The upper N and lower S lines should not be used as reference lines for this purpose.

Oiling.—The direction mechanism should have a drop of oil about once a month and the bearing of the long lever may need oiling at about the same period. The surface of the helix should be wiped over with an oily rag, but free oil there tends to gather dust and grit and should be avoided.

Tension of Control Spring.—There is sometimes lost motion between S and W on the chart, due to the weakening of the control spring between the direction and jockey arms. As a result, the roller of the direction arm instead of touching the top of the groove as it should in this position of the helix, drops down slightly into the cut away below. To strengthen the spring, disconnect the direction rod at the ball and socket joint, and turn the helix until the roller comes to the very top of the helix. The direction arm can then be lifted and the spring stretched. Only a very little stretching is necessary, and before reconnecting the direction rod see that the roller now passes over the cut away without falling into it at all. On the other hand, there may be lost motion between N and W. This will be because the control spring is too strong so that the roller, instead of touching the bottom of the groove in this position of the helix, runs along the top of the groove passing slightly into the cut away above. The control spring must, therefore, be weakened slightly. Hence, too weak a spring will cause loss of motion between S and W, while with the spring too strong there will be lost motion between N and W. When new, no adjustment of the spring should be necessary.

Lost motion may also occur as a result of wear on the roller, which does not then fit the groove of the helix. In such a case the only remedy is to have a new roller fitted.

Damping.—Oil is to be put into the dash-pot to prevent a too sudden movement of the direction arm when it passes down from the top N line to the middle N line and up from the bottom S line to the middle S line. This oil should not be allowed to get thick with dirt, otherwise excessive resistance will be encountered.

Log.—It is recommended that a log of all adjustments made to the instrument be maintained in a small note-book, to be kept in the hut in which the recording portion of the instrument is housed.

Attachment of Direction Plates.—The plate is made to fit the direction rod of the anemobiagraph and is clamped in position by

means of a set screw, so that it revolves with the rod, the wind direction being read by means of a fixed pointer close to the edge of the plate.

A calm day should be chosen for the fixing of the direction plate in order that undue strain may not be thrown on the instrument when the vane is rotated by hand from below.

The three screws which fasten the direction recorder to the top of the tank should first be removed, and then the two screws holding the top socket of the universal joint to the ball may be taken out and the direction recording structure placed on one side. It is then necessary to knock out the pin which passes through the top part of the universal joint and the screwed piece of the direction rod and unscrew and detach the top of the joint. The direction plate may then be slipped on to the rod and secured temporarily in position, the direction recorder being put together again in the reverse order to that in which it was dismantled. Great care must be taken in re-erecting the direction recorder that a relative error of 180° in direction is not introduced between the top of the socket and the direction rod or between the ball and socket, i.e., these must be replaced in exactly the same position as they were before removal.

A suitable pointer to indicate on the plate should be fixed to some convenient place, e.g., the top of the hut, and the plate orientated on the rod until the pointer reading agrees with the reading of the pen on the chart.

III. AGRICULTURAL CROP OBSERVATIONS.

1.—OBSERVATIONS IN GENERAL.

1. The observations should be taken on selected fields in the neighbourhood of the meteorological station. They should relate to the same varieties of crops each year.

2. Observations should be taken on the following crops :—

Corn Crops.—Wheat, Barley, Oats.

Root Crops.—Turnips, Swedes.

Grass.—Meadow Hay.

3. The observations required to be noted are :—

Corn Crops.—Variety, soil characteristics, previous cropping, manuring, cultural operations, date of sowing, date of appearance above ground, date of breaking into ear, date of flowering, date of harvest, the yield per acre of grain and straw, the weight per bushel of grain, and attacks of diseases and pests.

In the case of spring oats, only, an intermediate stage between the appearance above ground and the breaking into ear is

required to be noted. This intermediate stage is when the majority of plants in the field show four leaves. Observations made up to the present indicate that the crop usually remains in this condition for from five to seven days. Fig. 1 (Victory) represents a late four-leaf stage; Fig. 2 (Record) a medium stage. The observer should aim, if possible, at recording the date when the majority of plants in the field have reached the medium stage.

Root Crops.—Variety, soil characteristics, previous cropping, manuring, cultural operations, date of sowing, date of appearance above ground, date of breaking into rough leaf, yield per acre (tops and roots separately) and attacks of diseases and pests.

Meadow Hay.—Soil, manuring, cultural operations, date of flowering of (*a*) sweet vernal, (*b*) perennial rye grass, date of cutting, yield of hay per acre and attacks of diseases and pests.

4. The observations should be noted as soon as they are made in the FORM FOR RECORDING AGRICULTURAL CROP OBSERVATIONS.* Copies of this form will be supplied on application to the Ministry of Agriculture.

5. The completed form should be forwarded annually to the Ministry and a duplicate should be kept by the station.

6. The agricultural crop observer should keep a full crop weather diary on Form No. A. 173/T.G.*, in which he should record notes on the weather and his impressions of its effect on crops in general at the station. Any crop observations required to be recorded in the form for recording agricultural crop observations should also be noted, as they occur, in the diary. Should the agricultural crop observer record meteorological, horticultural, phenological and plant pest observations these should also be noted in the diary in the same way. If he does not record these other observations, he should obtain the diaries from the other observers for the purpose of the preparation of the summary (Instruction 8) and despatch them with his own. The diaries should be made out in duplicate; one set should be retained by the observer and the other forwarded monthly to the Ministry of Agriculture.

7. Where the staff of the station includes an entomologist and mycologist, the agricultural crop observer should enlist the aid of these officers in recording attacks of diseases and pests. If possible the presence of every pest affecting growth and yield must be detected and its effect estimated.

8. A monthly summary, for publication, of the events recorded in the diaries should be prepared in duplicate by the agricultural crop observer. One copy should be retained by the station and the other forwarded to the Ministry of Agriculture.

* See Appendix.



FIG 1

FIG 2

2.—PRECISION-SCHEME.

Information to be obtained.—The scheme of observations set out below, if faithfully carried out, will yield accurate information on the following points for particular crops of wheat :—

1. Date of sowing.
2. Date of brairding.
3. Date of harvest.
4. Date when the number of shoots is double the number of plants.
5. Date when half the ears have emerged.
6. Progress throughout the season of :—
 (*a*) Number of plants,
 (*b*) Number of shoots,
 (*c*) Height of plants,
 (*d*) Number of leaves,
 (*e*) Number of emerged ears,
 (*f*) Length of ripe ears.
7. Harvest measurements of :—
 (*a*) Fresh weights of plants (total and grain),
 (*b*) 1,000-corn weight,
 (*c*) Numbers of sterile grains, of diseased grains, and of grains stolen by birds,
 (*d*) Moisture content of grain.

Cultivation and Arrangement of Plots.—Observations should be made on two varieties of wheat, Yeoman and Squareheads Master. In order that the seed should be uniform it will all be supplied from a common source by the National Institute of Agricultural Botany. One bushel of each of the two varieties will be supplied to each station participating.

The rate of sowing should be uniform—as near to $2\frac{1}{4}$ bushels per acre as possible.

Cultivation and manuring should conform with local practice.

The seed should be drilled in alternate strips each two drill-widths across ; there should be five two-drill-width strips of one variety and four two-drill-width strips of the other variety. The same variety will thus be in the two outside drill-widths of the area ; the two outside drill-widths (one on each side of the area) will be edge strips and observations will not be taken on them.

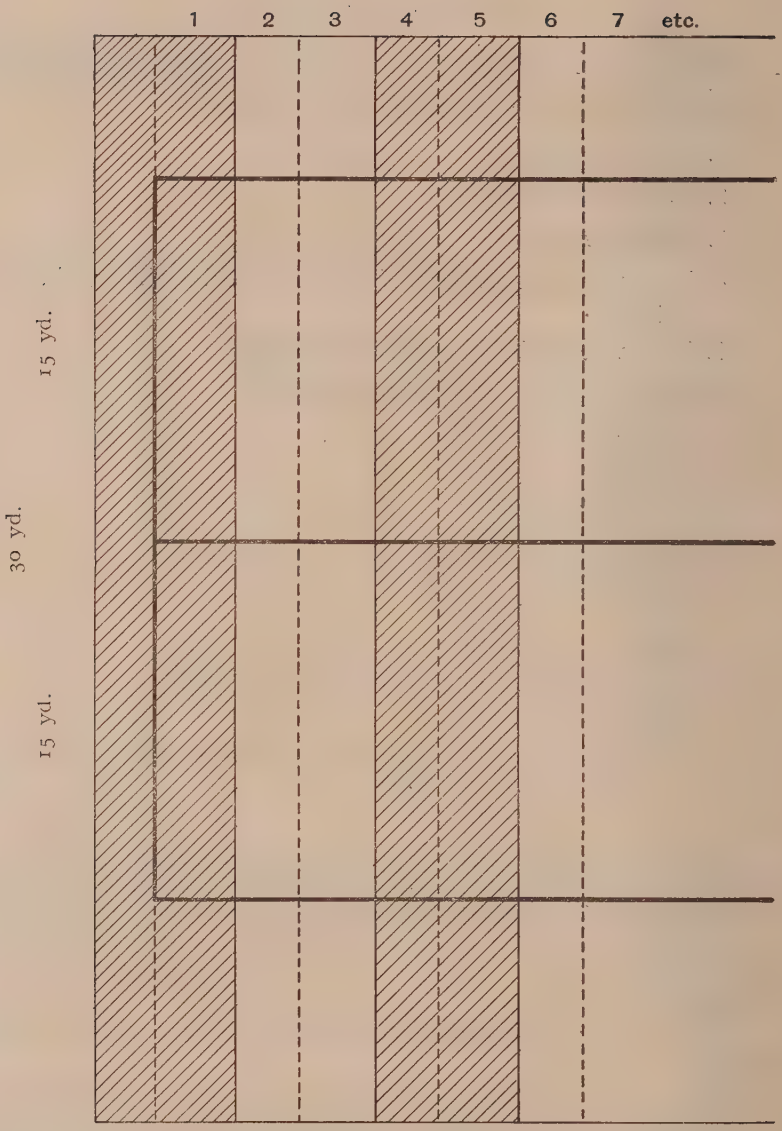
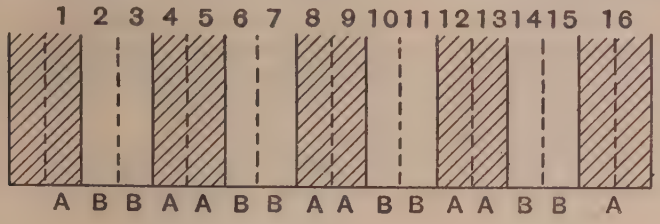


Diagram showing the division of the area into half-plots.

The remaining drill-widths will form four "sandwiches"—A, B, B, A—of the two varieties, as shown in the accompanying diagram :

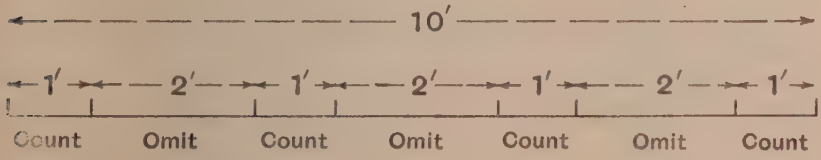


The length of the strips may be such as to suit the convenience of the station.

An area of the width of these four sandwiches and 30 yd. long, on as uniform a part of the larger area as possible, should be pegged out and divided into two by pegs half way across the area, i.e., at 15 yd.

In the following instructions each of the 16 strips 30 yd. long will be called a plot, and each of the two portions 15 yd. long into which the plot is divided transversely will be called a half-plot.

Use of Rod for Determining Samples.—Observations should be made on 1-foot lengths of row. A rod should be used on which four 1-foot lengths are marked, separated by three 2-foot spaces, thus :—



Four separate 1-foot lengths will thus be obtained for every placing of the rod in the row.

To facilitate the making of the observations 3-inch nails should be driven into the ends and middle of the rod and should project downwards so that the rod can be pressed firmly into the soil. At the ends of each 1-foot length similar nails should project horizontally towards the row on which observations are being made, so that the points at which the counting should start and finish are well defined. The rod should be as light as possible consistent with strength and rigidity.

Two placings of the rod should be made on each half-plot at the times at which the observations are taken : this gives thirty-two placings, or one hundred and twenty-eight separate 1-foot lengths of row for each variety : or two hundred and fifty-six lengths in all.

Selection of Rows for Observations.—The following procedure is designed to secure random selection for the two placings of the rod on each half-plot.

The two outside rows on each plot should not be used for observations. This will leave, say x rows from which a selection has to be made. Take a pack of cards numbered from 1 to the highest multiple of x less than 100. (If x is 13, the cards would run from 1 to 91 : if x is 14 from 1 to 98).

Thoroughly shuffle the cards, take the top two and write down the numbers by which they exceed the highest multiple of x they contain.

(If x is 14 and the top two cards are 47 and 84 the selected rows will be Nos. 5 and 14, respectively.)

Selection of Point in Row.—The placings of the rod in the 15-yard lengths have now to be determined. Take a pack of cards numbered from 1 to 90, i.e., the highest multiple of 15 below 100 ; thoroughly shuffle, take the top two cards and find the numbers by which they exceed the highest multiples of 15 they contain. These numbers give the number of yards down the plot from which to place the rod. It does not matter if the rod overlaps the end of the plot.

A set of four numbers is thus obtained, e.g. :—

Selected Row.	Yards from end of half-plot.
5	11
14	6

It will be found convenient to arrange the yards in ascending order, thus :—

Row from outside of Plot.	Yards.
15	6
6	11

Numbers must be obtained in the same way for each of the thirty-two half-plots and for each time observations are made. It will probably be found convenient to obtain all these " patterns " in advance to avoid a rush of work in heavy seasons.

An alternative method of arriving at locations on the plots in a purely random manner, is to make use of the tables of Random Sampling Numbers compiled by L. H. C. Tippett (Tracts for Computers, No. XV, Cambridge University Press). These tables form a list, in purely random order, of the numbers from 1 to 9999, arranged in blocks of 5, there being ten rows and eight columns of blocks per page. If, as in the present scheme, a random selection of thirty-two numbers from 1 to 15 is required, any row or column of two-figure numbers may be taken, and numbers obtained as outlined above.

E.g., on page (v) of the tables, the third column begins thus :—

0194
6561
3030
3062
5798

6040
8971
1023
etc.

Here one might take the last pairs of figures in each four-figure number, and take differences, ignoring numbers over 90 so that all numbers from 1–15 have an equal chance of occurring. The numbers noted down would therefore be :—

—
1
15
2
—
10
11
8

(The dashes indicate where no number is written down because a number above 90 was encountered.)

The procedure in the field would be, for the " patterns " quoted above, to pace 6 yd. down the fifteenth row, place the rod with the first horizontal nail just touching the toe and make the desired observations on the plants included within the four 1-foot lengths. Then move across to the sixth row and pace 5 yd. further : it is sufficient to pace out the distances.

Observations to be Taken.

1. *Date of sowing.*

2. *Condition of soil* at time of sowing—whether a fine tilth or cloddy and whether wet or dry.

3. *Date of " brairding,"* i.e., of appearance in rows.

4. The following counts and measurements :—

Number of Plants and Shoots.—In the early stages of growth, counts should be made of the total number of plants and of shoots in each foot.

The counts of plant and shoot number should be made at monthly intervals during the autumn and early winter, but, when active growth is resumed in the spring, at more frequent intervals so that the date at which there is on the average one tiller per plant may be fixed with some precision. This will

require fortnightly counts during the last half of January and first half of February, and then weekly counts until the ratio of shoots to plants has reached about 2 : 1. Fortnightly counts should then be resumed. At the end of April or beginning of May it will be found exceedingly difficult to count the number of plants with certainty. When this is the case, only the counts of total numbers of shoots should be continued.

During May and June late-formed tillers will die off in increasing numbers. Such tillers should not be counted from the time when the young leaves surrounding the stem-apex are seen to be yellow and withered, even if the lower leaves are still a full green. Hence, the number of shoots per unit length of row will attain a maximum value in May or June, and will then steadily decline until very few shoots, other than those which are going to form ears, will be left with their growing-points still functioning.

Height of Shoots.—The height to the top of the sheath of the youngest fully expanded leaf of the tallest shoots of the plants at the ends of each foot should also be measured to the nearest half-centimetre. This gives 8 height-measurements for each position of the rod. Height-measurements should be continued throughout the year.

Number of Leaves.—Counts of the total number of fully expanded leaves on each tiller of the plants at the ends of each 1-foot length should also be made. The number of leaves on each tiller should be recorded separately. These leaf-counts may be discontinued at the middle of April.

Number of Ears.—When ears appear, counts should be made of those which are fully emerged, i.e., in which the base of the ear is quite clear of its sheathing-leaf : usually the ear emerges through the top of the sheath, in which case the convenient determination of emergence is that the base should be above the auricle of the leaf-sheath : if, however, the ear emerges at the side of the sheath the less satisfactory determination must be that its base is clear of the sheath. Counts should be made at weekly intervals about the time when 50 per cent. of the ears are fully emerged, it being desirable to determine this date with precision. Counts of ear-emergence should be continued until harvest.

Just before harvest, measurements should be made of the length of the ears on those stems whose height is measured, i.e., the tallest shoots of the plants at the end of the 1-foot lengths. Measurements should be to the nearest millimetre.

Harvest Observations.—Cut each 1-foot length close to the ground when the crop is judged fit for harvest. The produce from the four 1-foot lengths cut at each placing of the rod may be tied into one sheaf. There will, therefore, be two sheaves from each half-plot,

thirty-two from each variety and sixty-four in all. Each sheaf should be labelled with its half-plot symbol and should be stored in a dry place for at least one week.

Weigh each sheaf (in grammes).

Thresh out the grain from each sheaf and weigh (in grammes).

Obtain a 1,000-corn weight for each half-plot, after mixing the grain of the two sheaves. (The 1,000-corn weights should be obtained to the nearest tenth of a gramme; other weights should be to a similar percentage accuracy.)

Count the fertile and sterile grains in ten ears selected at random from each half-plot. Diseased grains should also be noted.

Obtain percentage of moisture in the grain of each half-plot.

There is no objection to storing the sheaves for subsequent weighing and analysis, provided that care is taken to store the corn where it is in no danger of being damaged by mice, cockroaches, etc., or by damp.

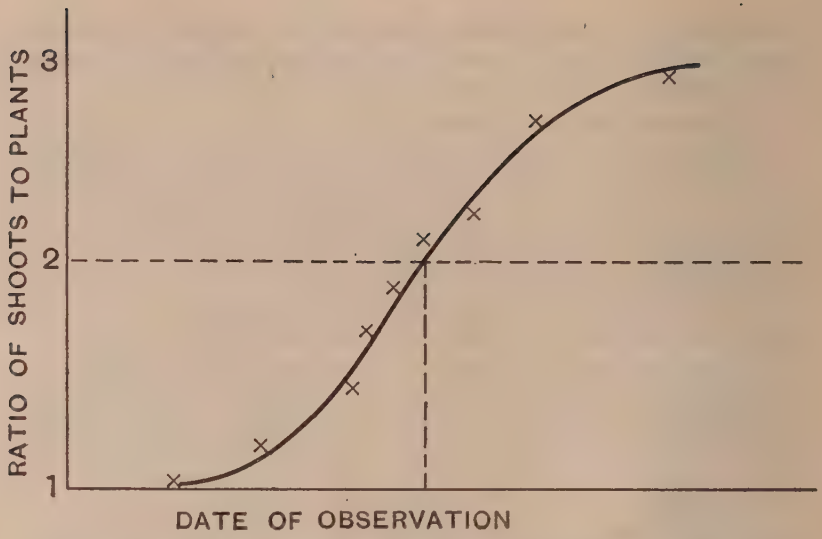
Visual observations.—The occurrence of standing water, disease, rabbit nibbling, lodging, bird-robbing or any other points considered to deserve attention should also be noted.

Reporting.—A headed notebook is supplied to each observer.

It will be of great assistance to the statistician dealing with these results if the observer makes a report, early in the spring, as to the certainty with which the date can be estimated when the ratio of shoots to plants reaches 2 : 1. This is easily discovered by plotting a graph with this ratio as ordinate and time as abscissa, as shown in the diagram below. If then, the course of the curve through the points is decided on with no difficulty, the point of intersection of this curve and the ordinate 2 is likewise fixed with considerable certainty. This curve will enable the observer to decide how frequently observations must be made at the critical stage in early spring.

In recording observations care should be taken to make a note not only of every measurement taken, but also of the position on the plot where the measurements were made. Thus the counts made on the four separate 1-foot lengths indicated by the rod should be recorded together, and in a definite order, starting always, for example, from the end at which pacing is begun. A plan of the plots should be made, and each half-plot should be assigned a letter or number which should be used throughout the records of observations. The orientation of the plots should also be marked on the plan, a copy of which should be inserted in the note-book. Note also the width of the plots, in feet and inches, and also in drill-rows.

A brief description of the type of soil in the plots, and topography of the field should be provided.



The note-books containing the observations should be sent to :—

The Chief Statistician,
Rothamsted Experimental Station,
Harpenden, Herts.

sa soon as possible after harvest.

IV.—HORTICULTURAL CROP OBSERVATIONS.

1. The observations should be taken on plots as close as possible to the meteorological station.

2. Observations should be taken on the following crops :—
Apples (Worcester and Bramley's Seedling).
Plums (Victoria).
Black-currants (Boskoop Giant).
Peas (Gradus).

3. The following instructions should be strictly complied with in order that uniformity may be secured :—

(1) *Apples.*—Four bush-trees of each variety. All bush-trees on 2-foot legs. If possible the apples should be on Doucin (Type 2) stock. The trees should not be pruned after the second year.

(2) *Plums.*—Four half-standard trees on Brussels stock. If newly planted, to be pruned back the first two years, then left unpruned.

(3) *Black-currants.*—Ten bushes, inter-planted, to be cut back at time of planting, and subsequently one-quarter of each bush to be removed annually.

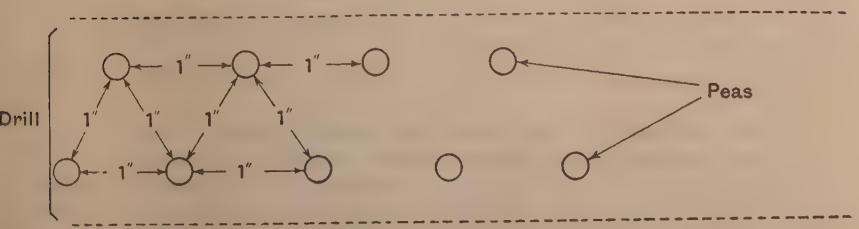
Stations should take particular care to obtain true stocks of Boskoop Giant.

Before pruning each black-currant bush the operator should sterilise his tool in some efficient manner. In the absence of a blow lamp it is suggested that the tool be immersed in a solution made by mixing one part of commercial formalin in 200 parts of water.

(*Note.*—No manure should be applied. Fruit trees should be sprayed when necessary, but only nicotine and soft soap (for uniformity, Red Poppy brand made by the MacDougall and Yalding Co., Ltd.), Bordeaux (4–4–50) and arsenate of lead (for uniformity, Charleton brand arsenate of lead paste made by Messrs. W. Voss and Co., Ltd.), should be used.

If any difficulty is experienced by stations in obtaining true stocks the Ministry of Agriculture will indicate a source of supply.

(4) *Peas.*—Seed should be sown in a single wide drill at the rate of 1 pt. of seed to every 40 ft. (to be distributed evenly over the drill with, as far as possible, a uniform distance of about 1 in. between each seed—*see* sketch below) during the first week in April. Two further sowings should be made at fortnightly intervals where possible, but the position of the latter sowings should be arranged so as not to interfere with the previous sowings. Seed should not be sprouted, soaked or treated in any way before sowing, except that red lead may be used as a protection against mice. Normal measures of protection against birds may be taken during the period of germination, but on no account should any blanks be filled. For uniformity no manure should be applied. Peas should be supported by wire netting 4 ft. high, 2½-inch mesh, 18 or 19 gauge, in two rows 6 in. apart. As a protection against bird damage wire netting runs should be placed over the rows after germination and, later, the peas should be enclosed by fish netting. The Ministry of Agriculture will obtain and distribute a supply of seed from one source.



4. The observations named on the four FORMS FOR RECORDING HORTICULTURAL CROP OBSERVATIONS (Apples, Plums, Black currants and Peas)* should be taken. Each phenomenon should be noted on the respective form as it occurs. The forms should be completed in duplicate and one set immediately despatched to the Ministry of Agriculture. The duplicate set should be retained by the station. Copies of the forms will be supplied on application to the Ministry of Agriculture.

5. Horticultural crop observers should keep in touch with bee-keepers with regard to honey-flow, in view of its importance in connection with the question of pollination.

6. The horticultural crop observer should keep a crop weather diary on Form No. A. 172/T.G.,* in which he should record his impressions of the effect of weather on fruit and vegetables in general at the station. Any observations required to be noted in the forms for recording horticultural crop observations should also be recorded as they occur in the diary. If there is an agricultural crop observer at the station, the diary should be handed to him monthly for the purpose of the preparation of the summary. If there is no agricultural crop observer, the horticultural crop observer should undertake the work prescribed in paragraphs 6 and 8 of section III, so far as it relates to the collection of the diaries of other observers, their summarisation and despatch to the Ministry of Agriculture.

7. Where the staff of the station includes an entomologist or mycologist, the horticultural crop observer should enlist the aid of these officers in recording attacks of diseases and pests. Stations which do not possess specialist plant pathologists must if possible enlist the aid of provincial plant pathologists when it is clear that the crops are suffering from the attacks of pests. If possible the presence of every pest affecting growth and yield must be detected and its effect estimated.

V.—PHENOLOGICAL OBSERVATIONS.

1.—GENERAL SCHEME.

The observations required under the general phenological scheme are named on Form No. A 237/T.G.*

The instructions to observers will be found in the notes on the form.

This scheme is recommended only where stations do not undertake the phenological gardens scheme, which, it is hoped, will be undertaken by as many stations as possible. Welsh stations which are unable to undertake the phenological gardens scheme are recommended to undertake the special Welsh phenological scheme.

* *See* Appendix.

2.—PHENOLOGICAL GARDENS SCHEME.

1. The phenological garden should be as near to the meteorological instruments as is practicable.

2. The area of the garden should be about 4 rods and the manner in which it is planted will be left to the discretion of the local staff. The bushes included in the list, however, should be so planted as to give sufficient shade to those plants requiring it. The garden should be kept reasonably clean.

3.—*List of Plants.*—

‡Christmas Rose, White (*Helleborus niger*).
‡Snowdrop (*Galanthus nivalis*).
Mezereon, Red form (*Daphne mezereum*).
‡Yellow Crocus (*Crocus aureus*).
*†‡Hazel (*Corylus avellana*).
‡Lesser Celandine (*Ranunculus ficaria*).
*†‡Wild (Dog) Rose, (pink) (*Rosa canina*).
Purple Plum (*Prunus pissardi*).
†Wood Anemone (*Anemone nemorosa*).
*†‡Blackthorn or Sloe (*Prunus spinosa*).
‡Lilac (*Syringa vulgaris*).
‡Bird Cherry (*Prunus padus*).
Common Arum, Lords and Ladies (*Arum maculatum*).
*†‡Hawthorn, May or Whitethorn (*Crataegus oxyacantha*).
Woodruff (*Asperula odorata*).
*†‡Ox-eye Daisy (*Chrysanthemum leucanthemum*).
*‡Elder (*Sambucus nigra*).
Broom (*Cytisus Andreanus*).
*†Black Knapweed (*Centaurea nigra*).
Privet (*Ligustrum vulgare*).
Honeysuckle or Woodbine (*Lonicera periclymenum*).
†‡Devil's Bit Scabious (*Scabiosa succisa*).
*Tansy (*Tanacetum vulgare*).
‡Autumn Crocus (*Colchicum autumnale*).

Arrangements have been made for the propagation of the plants from common stocks for distribution to stations. Plants will be supplied on application to the Ministry of Agriculture.

4. Observations should be taken in accordance with the following definitions :—

(*a*) *Date of Flowering.*—This should be when the first flower is out and the whole plant or association of plants is on the point of flowering. The stray blossom which sometimes appears long before the normal blooming time should be

* On general list (Agricultural Meteorological Scheme).
† In Royal Meteorological Society's Schedule.
‡ In International Schedule.

disregarded. Only the female flowers of Hazel are to be observed. They are the little bright red flowers which as a rule open directly after the male flowers or catkins.

(*b*) *Date of First Leafing*.—This should be when the leaf is flat.

(*c*) *Leafless*.—This should be when approximately 90 per cent. of the leaves have fallen.

5. The phenomena to be noted are named on the FORM FOR RECORDING PHENOLOGICAL OBSERVATIONS (Phenological Gardens).* Each phenomenon should be noted in this form as it occurs. The form should be completed in duplicate and one copy immediately despatched to the Ministry of Agriculture. The other copy should be retained by the station. Copies of the form will be supplied on application to the Ministry of Agriculture.

6. Phenological observers should keep, in duplicate, a phenological diary (forms supplied by the Ministry of Agriculture) in which to note the observations as they occur. The diary should also contain the observer's own impressions of the effect of the weather on the plants under observation. One copy of the diary should be handed at the end of each month to the agricultural or horticultural observer at the station for the purpose of the preparation of the summary.

3.—WELSH SCHEME.

1. In the case of shrubs the observations should always be made on the same plant. In the case of herbs, attention must always be confined to the same area, which should be small.

2. The following particulars should be recorded :—

(*a*) A general description of the locality.

(*b*) Elevation and aspect of plant, whether in shady place or freely exposed to the sun, and whether in hedgerow, open field, thicket, wood or roadside.

3. Observations should be taken in accordance with the following definitions :—

(*a*) *First Leafing*.—This should be when the leaf is flat.

(*b*) *Commencement of Flowering*.—A plant should be regarded as in flower when the third flower has shown itself. This will eliminate the disturbing effect of noting a first and often precocious flower. Only the female flowers of Hazel are to be observed. They are little bright red flowers, which as a rule open directly after the male flowers or catkins. Care should be taken to distinguish the normal *Prunus spinosa* from the earlier small-flowered forms and from the Wild Bullace.

(*c*) *Zenith of flowering*.—This can only be an approximate date and generally synchronizes with a time when the earlier produced flowers are commencing to fade.

* *See* Appendix.

(*d*) *Fruit Ripe.*—When fully coloured and soft.

4. A dried specimen of each of the twelve species of plants upon which observations are made should be sent to the Regional Officer (Instruction 11) in order that he may be satisfied that identification is in every case correct.

5. *List of Plants.*—

Hazel (*Corylus avellana*).
Lesser Celandine (*Ranunculus ficaria*).
Coltsfoot (*Tussilago farfara*).
Wood Anemone (*Anemone nemorosa*).
Blackthorn or Sloe (*Prunus spinosa*).
Hawthorn, May or Whitethorn (*Crataegus oxyacantha*).
Woodruff (*Asperula odorata*).
Ox-eye Daisy (*Chrysanthemum leucanthemum*).
Honeysuckle or Woodbine (*Lonicera periclymenum*).
Wild (Dog) Rose (pink) (*Rosa canina*).
Germander or Wood Sage (*Teucrium Scorodinia*).
Black Knapweed or Hardhead (*Centaurea nigra*).

6. The date on which the Cuckoo is first heard and the date of the first appearance of the Swallow and Garden White Butterfly (*pieris rapa*) are to be noted.

7. Observations are also required on the sowing and harvesting of oats, sowing of swedes, haymaking, lambing and the movement of cattle.

8. Detailed reports should also be made, if possible, on the incidence of fungous diseases and the like.

9. The observer should also endeavour to collect from his district any local country lore bearing upon the phenological-crop relationship which this section of the Agricultural Meteorological Scheme is designed to study.

10. The observations are named on the FORM FOR RECORDING PHENOLOGICAL OBSERVATIONS (WALES).* Each phenomenon should be noted in this form as it occurs. The form should be completed, in duplicate, and one copy immediately despatched to the Regional Officer (Instruction 11). The duplicate should be retained at the centre. Copies of the form will be supplied by the Regional Officer.

11. The observer should report to the Regional Officer for the college-area in which the centre is located, whose address is :—

Aberystwyth area	...	Welsh Plant Breeding Station, Aberystwyth.
Bangor area ...	...	University College of North Wales, Bangor.
Cardiff area ...	...	University College of South Wales, Cardiff.

* *See* Appendix.

VI. SUMMARY OF MONTHLY DIARIES.

The agricultural crop observer (or horticultural crop observer : Instruction 6 of Section IV) is required to prepare a summary of the monthly diaries on Form No. A. 176/T.G.* Its object is to bring together in a concise form the more important facts relating to the meteorological and agricultural conditions during the month in respect of which the diaries are written. The summaries are published in the monthly Agricultural Meteorological Report and, when read collectively, should give a general idea of the weather and agricultural conditions throughout the country.

It should be borne in mind that a concise and carefully written summary in general terms may serve a more useful purpose than a lengthy repetition of the details contained in the diaries themselves. The summary forms are divided into headed sections and observers should adhere to the headings and should find no difficulty in confining their remarks to the space allowed. The information contained in the summaries relates to a past period and it will facilitate the preparation of the summaries for publication if they are written in a past tense.

VII. AGRICULTURAL METEOROLOGICAL COMMITTEE.

Sir Napier Shaw, F.R.S. (Chairman).
Professor V. H. Blackman, Sc.D., F.R.S.
Mr. R. Corless, O.B.E., M.A.
Dr. R. A. Fisher, M.A., F.R.S.
Mr. J. C. F. Fryer, M.A.
Mr. R. G. K. Lempfert, C.B.E., M.A.
Sir T. H. Middleton, K.B.E., C.B.
Mr. J. Ramsay, O.B.E.
Mr. H. G. Richardson, M.A., B.Sc.
Professor A. G. Tansley, M.A., F.R.S.
Mr. H. V. Taylor, O.B.E.
Mr. W. R. Black, M.B.E. (Secretary).

METEOROLOGICAL SUB-COMMITTEE.

Mr. R. G. K. Lempfert (Chairman).
Mr. R. Corless.
Dr. B. A. Keen.
Mr. C. S. Leaf.

* *See* Appendix.

HORTICULTURAL SUB-COMMITTEE.

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Professor B. T. P. Barker.
Mr. F. J. Chittenden.
Mr. R. G. Hatton.
Mr. C. Wright.
Mr. P. Inkpen (Secretary).

PHENOLOGICAL SUB-COMMITTEE.

Professor A. G. Tansley (Chairman).
Dr. W. E. Brenchley.
Mr. J. E. Clark.
Mr. J. C. F. Fryer.
Mr. I. D. Margary.
Mr. A. Roebuck.
Professor R. G. Stapledon.
Mr. P. Inkpen (Secretary).

STATISTICAL METHODS SUB-COMMITTEE.

Sir Napier Shaw (Chairman).
Dr. R. A. Fisher.
Mr. H. V. Taylor.
Professor A. G. Tansley.

VIII. LIST OF STATIONS.

District 1.

Craibstone (*North of Scotland College of Agriculture*).
Meteorological and agricultural crop station.
Boghall (*East of Scotland College of Agriculture*).
Meteorological and agricultural crop station.

District 2.

Cockle Park (*Northumberland Agricultural Experiment Station*).
Meteorological, agricultural crop and phenological station.
Houghall, Durham (*Horticultural Station*).
Meteorological and horticultural crop station.
Osgodby, Selby (*Fruit Testing Station*).
Meteorological, horticultural crop and phenological station.

District 3.

Sprowston (*Norfolk Agricultural Station*).
Meteorological, agricultural crop and phenological station.
Cambridge (*National Institute of Agricultural Botany*).
Agricultural crop station (including Precision-Scheme).
Cambridge (*University Farm*).
Meteorological, agricultural crop, horticultural crop and phenological station.
Wisbech (*Horticultural Demonstration Plot*).
Meteorological and horticultural crop station.
Rothamsted Experimental Station.
Meteorological and agricultural crop station (including Precision-Scheme).
Good Easter (*East Anglian Institute of Agriculture*).
Meteorological and agricultural crop station (including Precision-Scheme).

District 4.

Sutton Bonington (*Midland Agricultural College*).
Meteorological agricultural crop, horticultural crop and phenological station.
Sandford, Oxford (*University Farm*).
Meteorological and agricultural crop station.
Newport, Salop (*Harper Adams Agricultural College*).
Meteorological and agricultural crop station (including Precision-Scheme).
Perdiswell, Worcester (*Horticultural Demonstration Plot*).
Meteorological and horticultural crop station.

District 5.

Wisley (*Royal Horticultural Society's Gardens*).
Meteorological and horticultural crop station.
East Malling Research Station.
Meteorological, horticultural crop and phenological station.
Wye (*South-Eastern Agricultural College*).
Meteorological, agricultural crop, (including Precision-Scheme), horticultural crop and phenological station.
Long Sutton (*Lord Wandsworth Agricultural College*).
Meteorological and agricultural crop station (including Precision-Scheme).

District 7 (*b*).

Aber, Bangor (*College Farm*).
Meteorological, agricultural crop and phenological station.

District 8 (*a*).

Aberystwyth (*Welsh Plant Breeding Station*).
Meteorological, agricultural crop and phenological station.
Aberystwyth (*Llety-evan-hen*).
Meteorological sub-station.

DISTRICT 8 (*b*).

Cannington (*Somerset Farm Institute*).
Meteorological, agricultural crop and phenological station.
Long Ashton Research Station.
Meteorological, horticultural crop and phenological station.
Newton Abbot (*Seale-Hayne Agricultural College*).
Meteorological, horticultural crop and phenological station.
Ellbridge, St. Mellion (*Experimental Station*).
Meteorological and horticultural crop station.
Gulval, Penzance (*Experimental Station*).
Meteorological and horticultural crop station.

APPENDIX.

M.O. Form No. 3203.

M.O. Form No. 3205.

Form No. A. 174/T.G.

Form for Recording Agricultural Crop Observations.

Form No. A. 173/T.G.

Form for Recording Horticultural Crop Observations (Apples).

Form for Recording Horticultural Crop Observations (Plums).

Form for Recording Horticultural Crop Observations (Blackcurrants).

Form for Recording Horticultural Crop Observations (Peas).

Form No. A. 172/T.G.

Form No. A. 237/T.G.

Form for Recording Phenological Observations (Phenological Gardens).

Form for Recording Phenological Observations (Wales).

Form No. A. 176/T.G.

Form 3203.

AIR MINISTRY, METEOROLOGICAL OFFICE.

METEOROLOGICAL REGISTER

FOR USE AT

CLIMATOLOGICAL STATIONS

(Stations of the Third Order of the International Classification, see Meteorological Observer's Handbook M.O. 191).

Station *Month and Year* *19*....

INSTRUMENTS IN USE.

NOTE.—Observers should communicate with the Office before making any change in the instruments or their position.

	Number.	Correction.			Number	Correction.			Number.	Correction.	
Barometer			at	Dry Bulb			at	Earth Thermometer 1 ft.			at
Sunshine Recorder		—	—	Wet Bulb			at	,, ,, 4 ft.			at
Rain-Gauge		—	—	Maximum Thermometer			at	Solar Maximum Thermometer		—	—
Measuring Glass			at	Minimum ,,			at	Grass Minimum Thermometer			at

It is desirable that the readings of the thermometers should be corrected for instrumental errors before being entered in this form. The action taken should in every case be indicated at the foot of the corresponding column.

OBJECTS USED FOR ESTIMATES OF VISIBILITY.

Standard Distance.	Object.	Standpoint.	Actual Distance.	Bearing.	Standard Distance.	Object.	Standpoint.	Actual Distance.	Bearing.
A 27 yds.					G 1½ mile.				
B 55 yds.					H 2½ miles.				
C 110 yds.					I 4⅓ miles.				
D 220 yds.					J 6½ miles.				
E 550 yds.					K 12½ miles.				
F 1100 yds.					L 18⅔ miles.				
					M 31 miles.				

The details of this schedule need not be filled in each month. They should all appear in the January Return. The letter corresponding with the most distant of the named objects, visible at the time of observation, is to be entered in the Register. When the object A cannot be seen the appropriate entry is X.

BEAUFORT LETTERS, INTERNATIONAL SYMBOLS AND CODE FOR STATE OF THE GROUND.

Appearance of Sky:—

- b Blue sky, whether with clear or hazy atmosphere.
- c Cloudy, *i.e.*, detached opening clouds.
- o Overcast, *i.e.*, the whole sky covered with one impervious cloud.
- g Gloom.
- u Ugly, threatening sky.

Wind:—

- Gale. (Force 8 or above)
- q Squalls.
- KQ Line squall.

Precipitation:—

- r ● Rain.
- p ● Passing showers.
- d ●° Drizzle.
- s ✳ Snow.
- ← Ice crystals in the air.
- rs ⊛ Sleet, *i.e.*, rain and snow together.
- △ Soft hail.
- h ▲ Hail.

Electrical Phenomena:

- t ┬ Thunder.
- l ≤ Lightning.
- tl ⊼ Thunderstorm.

Atmospheric Obscurity and Water Vapour:

- f ≡ Fog } Range of Visibility less than 1100 yards.
- fe ≡: Wet Fog }
- z ∞ Haze† } Range of Visibility 1100 yards or more, but less than 1* mile.
- m ≡° Mist† }
- — ≡ Dust storm or Sand storm.
- v ◊ Unusual Visibility of distant objects.
- e Wet air, without rain falling.
- y Dry air (less than 60% humidity).

Ground Phenomena:—

- w ⌓ Dew.
- x ⌴ Hoar frost.
- V Rime.
- ~ Glazed frost.
- ⊞ Snow lying.*
- ✣ Drift-snow.

Optical Phenomena:

- ⓘ Solar corona.
- ⊕ Solar halo.
- ⓘ Lunar corona.
- ⓓ Lunar halo.
- ⌒ Rainbow.
- Aurora.
- Zodiacal Light.
- Mirage.

State of the Ground

1=Dry ground.
1=Wet ground.
2=Soft (muddy) wet ground.
3=Bare ground frozen (but less than 2-in. deep).
4=Bare ground frozen (but more than 2-in. deep).
5=Dew (or wet grass but not wet ground).
6=Hoar frost, morning observation.
7=Snow (thin layer, often not continuous).
8=Snow (deep, impeding traffic, usually a continuous layer).
9=Glazed roads (ice on roads from frozen rain or melted snow).

Exponents o and 2 applied to the international symbols indicate respectively light and heavy. Capital letters are used to denote great intensity, and the suffix o light intensity, and repetition of letters to denote continuity, thus:—H or ▲° indicates heavy hail, ●° light rain, ≡° slight fog or mist, RR=continuous heavy rain, ro=light rain, etc. As a rule, Beaufort letters should be used in the "Weather" columns. Symbols and letters can be used in the "Remarks" column.

* More than half the country in sight covered with snow. † See Meteorological Observer's Handbook M.O. 191, p.50 (1926 edition).

Standard of Time. Observations should be made at 9 a.m. Local Mean Time (L.M.T.). Observers should consult the Meteorological Observer's Handbook, 1926 edition, p. 6, to obtain the Greenwich Mean Time (G.M.T.) which is equivalent to 9 a.m. L.M.T.
Observations should be made 1 hour later by the Railway or Post Office clock when Summer Time begins, *i.e.*, the Greenwich Time of observation is unchanged. Both G.M.T. and clock time should be entered at the top of the other side of this form.

Temperature. Max. and Min. temperatures are to be given to the nearest whole degree. When the maximum and minimum thermometers are read and set in the morning, the reading of the maximum thermometer must be entered to the previous day, that of the minimum to the day of reading. The highest and lowest maximum and the highest and lowest minimum should be underlined. The grass minimum should be read at 9 h. It should be taken in during the day and put out in the late afternoon.

Weather Summary. Enter a zero when there are no occasions of a phenomenon, and a dash — when there is no information.

Rainfall. If measured in the morning enter to the previous day in column 23.
Always express a rainfall measurement by two figures at least (inserting zeros where necessary to effect this), and see that the position of the decimal point is correct, *e.g.*—

Millimetre measurements 0·7, 7·0, 8·7, 24·3.
Inch measurements ·01, ·11, 1·10.

Three figures are required only when the measurement exceeds 9·9 mm. or ·99 inch.
When there has been no precipitation the entry in column 23 should be a dash — (not ·00). The entry "trace" or "tr." is to be made in the two following cases, (A) and (B).

(A) When there is less than ·005 inch or ·05 mm. of water in the gauge and the observer knows that this is not the result of a drop or two draining from the sides of the can after emptying the rainwater out of it at a previous time of observation, *i.e.*, the observer must be reasonably certain that there has actually been precipitation since the preceding measurement. If the observer knows that the precipitation has been in the form of dew or wet fog this may be noted in the remarks column.

(B) The observer knows definitely from his own observation that some rain (or other form of precipitation such as snow, hail, sleet or drizzle) has fallen since the preceding observation, and yet finds no water in the gauge. This happens sometimes especially in dry, warm weather, without the gauge being even damp, the small amount of rain having evaporated before it got into the receiving can.

P2765, P528P-2275, 3000, 8/29. Malby & Sons, Photo-Litho.

Meteorological Observations at County Month 19

Heights above M.S.L. — Barometer Cistern ... feet. Rain-Gauge Site ... feet.

Heights above Ground — Rim of Rain-Gauge ... ins. Thermometers .. feet. Sunshine Recorder .. ,, Vane or Cups of anemometer .. ,,

Hour of Observation: I.= h. m. Greenwich Time. a.m. Railway or Post Office Time.

Maximum thermometer (col. 6) set read Latitude ° ′

Minimum thermometer (col 7) set read Longitude ° ′

Attached Thermometer and Barometer as read ‡‡		Day.	Air Pressure at Mean Sea Level	Temperature (Degrees) F. In Screen. Dry.	Wet	Max.	Min.	Min. on Grass.	Max. in Sun. Black Bulb in vacuo	In Ground 1 foot.	4 foot.	Humidity Vapour Pressure.	Relative Humidity.	Wind. Beaufort Scale.	Weather* Beaufort Letters. Since Midnight †	At time of Observation.	To Midnight. †	Visibility.	Cloud Amount.	Form.	Direction whence coming	Amount of Rain Measured next morning.	State of the Ground.	Sun-shine. Duration. (Hours and tenths.)	REMARKS. (For the 24 hours ending at midnight) Enter here brief general remarks and such particulars as the time of occurrence and duration of various phenomena especially those set out in the "Weather" Summary below. Columns 27 should be reserved for the International Symbols. The symbol for rain need not be entered however. The symbol ⊠ in column 27 indicates snow lying at the morning observation. During the period when clocks are advanced ("Summer Time"), are times of events in this column ordinary clock time? (1) Yes. (2) No: G.M.T. is used (1 hour subtracted from clock time). Please strike out (1) or (2) above.	Symbols (*vide* reverse)	
I.			I.	I.								I.	I.	I.				I.	I.	I.	I.				(26)	(27)	
				Whole degrees.				Whole degrees.		Tenths.																	
(1) °	(2) mb. or in		(3) mb. or in	(4) °	(5) °	(6) °	(7) °	(8) °	(9) °	(10) °	(11) °	(12)	(13) %	(14) Direction	(15) Force	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23) mm. or in.	(24)	(25) hr.		
		1																									
		2																									
		3																									
		4																									
		5																									
		6																									
		7																									
		8																									
		9																									
		10																									
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		29																									
		30																									
		31																									
		Sums						—	—					—	—				—				—				
		Means						—	—					—	—				—			—	—				

Instrumental Corrections to Temperature ¶¶ ..

Corrected Mean Temperatures ..

Extremes.

Temperature Highest Max. (Column 6) on

Lowest Min. (Column 7) on

Lowest Max. (Column 6) on

Highest Min. (Column 7) on

Lowest Grass Min. (Column 8) on

Rainfall Greatest Fall in a day mm. on

Air Pressure at M.S.L. .. Highest on

Lowest on

‡‡ If the corrected values are entered daily in column 3, observers at stations below 600 feet altitude need not fill up columns 1 and 2.

¶¶ If corrections have been applied to individual readings insert a tick (√). If no corrections are necessary insert a dash (—). If the mean is to be corrected insert the correction.

Wind. No. of Obsns.		For use at M.O.
Forces 8-12.		
Forces 4-7.		
Forces 1-3.		
Calm.		
N	NNE.	
NE.	ENE.	
E.	ESE.	
SE.	SSE.	
S.	SSW.	
SW.	WSW.	
W.	WNW.	
NW.	NNW.	

Weather	No. of days.
Precipitation 0·01 in. 0·2 mm. ** } or more	
,, 0·04 in. 1·0 mm. } or more	
Snow or Sleet ✳ ⛆ ..	
Snow lying (at obsn. hour) ⊠	
Hail ▲ or △	
Thunder heard ϒ	
Fog (at obsn. hour) .. i.e., vis. less than 1100 yards.	
Ground Frost i.e., grass min. 30·4° F. or less.	
Gale (Force 8 or more) ≠ ..	

* See Table and Note on reverse.

† In columns 16 and 18 commas should be used to separate phenomena which occurred after one another.

** Measurements of 0·1 mm. excluded.

‡ Cross out the capital letters and put a small letter if there is no object within 10% of the standard distance.

Visibility‡ Number of Cases of—

X	A	B	C	D	E	F	G	H	I	J	K	L	M

Cloud Amount.					State of Ground.									
0	1-3	4-6	7-9	10	0	1	2	3	4	5	6	7	8	9

NOTE.—The method adopted for dealing with temperature corrections is shown at the foot of columns 4—11.

(Signed)*Observer.*

This Register should be forwarded in the envelope provided **immediately after the end of the month and in no case later than the 6th of the following month** to—

THE DIRECTOR,
METEOROLOGICAL OFFICE (M.O.7),
LONDON, S.W.7, or EDINBURGH.

[P.T.O. for instructions about Temperature and Rainfall.]

(METEOROLOGICAL OFFICE. Form 3205.) MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM B FOR RECORDING METEOROLOGICAL OBSERVATIONS

additional to those in M.O. Form 3203.

at_____ County_____ Month_____ 192

Nature and average depth of soil_____ Standard of Time, G.M.T.

Day.	Dry and Wet Bulb Thermometers.				Dew Point.			Relative Humidity.		Soil Temperature.							Wind.*				Accumulated Temperature.		Day.
										4 inches			8 inches			2 ft.	15 h.		21 h.		Day—deg. F.		
	15 h.		21 h.		9 h.	15 h.	21 h.	15 h.	21 h.	9 h.	15 h.	21 h.	9 h.	15 h.	21 h.	9 h.					above 42°	below 42°	
	Dry.	Wet.	Dry.	Wet.													Direction.	Force.	Direction.	Force.	A	B	
	°	°	°	°	°	°	°	%	%	°	°	°	°	°	°	°							
1																							1
2																							2
3																							3
4																							4
5																							5
6																							6
7																							7
8																							8
9																							9
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26																							26
27																							27
28																							28
29																							29
30																							30
31																							31
Sums																	—	—	—	—			
Means																	—	—	—	—			
					—	—	—	—	—														
					—	—	—	—	—														

Instrumental Corrections to Temperature.

Corrected Mean Temperatures.

*At a station possessing an anemobiagraph the wind should be estimated by eye for speeds less than Beaufort Force 4.

WIND—No. of Observations of.

Hour.	Force 8 or more.	Forces 4-7	Forces 1-3.	Calm.	NNW.	N.	NNE.	NE.	ENE.	E.	ESE.	SE.	SSE.	S	SSW.	SW	WSW.	W.	WNW.	NW
9 h.																				
15 h																				
21 h.																				
Total																				
For use at M.O.																				

(Signed)

_____ *Observer.*

This Register should be forwarded in the envelope provided, immediately after the end of the month to—

The Director.
Meteorological Office (M.O.7.),
London, S.W. 7 (or Edinburgh).

FORM NO. A174/T.G.
(Yellow.)

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

MONTHLY DIARY.

METEOROLOGICAL OBSERVATIONS.

(See Observers' Handbook, Section II. 1, par. 7.)

STATION_____ MONTH_____ 192__

1st

2nd

&c.

31st

(*Signed*)_____
(*Observer.*)

The Diary should be prepared in duplicate. One copy retained by the Station and the other forwarded to the Ministry of Agriculture. 10, Whitehall Place, London, S.W.1.

Form 3203.

AIR MINISTRY, METEOROLOGICAL OFFICE.

METEOROLOGICAL REGISTER

FOR USE AT

CLIMATOLOGICAL STATIONS

(Stations of the Third Order of the International Classification, see Meteorological Observer's Handbook M.O. 191).

Station *Month and Year* *19*

INSTRUMENTS IN USE.

NOTE.—Observers should communicate with the Office before making any change in the instruments or their position.

	Number.	Correction.		Number.	Correction.		Number.	Correction.
Barometer		at	Dry Bulb		at	Earth Thermometer 1 ft.		at
Sunshine Recorder		— —	Wet Bulb		at	,, ,, 4 ft.		at
Rain-Gauge		— —	Maximum Thermometer		at	Solar Maximum Thermometer		— —
Measuring Glass		at	Minimum ,,		at	Grass Minimum Thermometer		at

It is desirable that the readings of the thermometers should be corrected for instrumental errors before being entered in this form. The action taken should in every case be indicated at the foot of the corresponding column.

OBJECTS USED FOR ESTIMATES OF VISIBILITY.

Standard Distance.	Object.	Standpoint.	Actual Distance.	Bearing.	Standard Distance.	Object.	Standpoint.	Actual Distance.	Bearing.
A 27 yds.					G 1¼ mile.				
B 55 yds.					H 2½ miles.				
C 110 yds.					I 4½ miles.				
D 220 yds.					J 6½ miles.				
E 550 yds.					K 12½ miles.				
F 1100 yds.					L 18⅝ miles.				
					M 31 miles.				

The details of this schedule need not be filled in each month. They should all appear in the January Return. The letter corresponding with the most distant of the named objects, visible at the time of observation, is to be entered in the Register. When the object A cannot be seen the appropriate entry is X.

BEAUFORT LETTERS, INTERNATIONAL SYMBOLS AND CODE FOR STATE OF THE GROUND.

Appearance of Sky:—

- b Blue sky, whether with clear or hazy atmosphere.
- c Cloudy, *i.e.*, detached opening clouds.
- o Overcast, *i.e.*, the whole sky covered with one impervious cloud.
- g Gloom.
- u Ugly, threatening sky.

Wind:—

- Gale. (Force 8 or above)
- q Squalls.
- KQ Line squall.

Precipitation:—

- r Rain.
- p Passing showers.
- d Drizzle.
- s Snow.
- ← Ice crystals in the air.
- rs Sleet, *i.e.*, rain and snow together.
- △ Soft hail.
- h ▲ Hail.

Electrical Phenomena:

- t Thunder.
- l Lightning.
- tl Thunderstorm.

Atmospheric Obscurity and Water Vapour:

- f Fog } Range of Visibility less than 1100 yards.
- fe Wet Fog }
- z Haze† } Range of Visibility 1100 yards or more, but less than 1* mile.
- m Mist† }
- — Dust storm or Sand storm.
- v Unusual Visibility of distant objects.
- e Wet air, without rain falling.
- y Dry air (less than 60% humidity).

Ground Phenomena:—

- w Dew.
- x Hoar frost.
- Rime.
- Glazed frost.
- Snow lying.*
- Drift-snow.

Optical Phenomena:

- Solar corona.
- Solar halo.
- Lunar corona.
- Lunar halo.
- Rainbow.
- Aurora.
- Zodiacal Light.
- Mirage.

State of the Ground

- 1=Dry ground.
- 1=Wet ground.
- 2=Soft (muddy) wet ground.
- 3=Bare ground frozen (but less than 2-in. deep).
- 4=Bare ground frozen (but more than 2-in. deep).
- 5=Dew (or wet grass but not wet ground).
- 6=Hoar frost, morning observation.
- 7=Snow (thin layer, often not continuous).
- 8=Snow (deep, impeding traffic, usually a continuous layer).
- 9=Glazed roads (ice on roads from frozen rain or melted snow).

Exponents o and 2 applied to the international symbols indicate respectively light and heavy. Capital letters are used to denote great intensity, and the suffix o light intensity, and repetition of letters to denote continuity, thus:—H or ▲° indicates heavy hail, ●° light rain, ≡ ° slight fog or mist, RR=continuous heavy rain, ro=light rain, etc. As a rule, Beaufort letters should be used in the "Weather" columns. Symbols and letters can be used in the "Remarks" column.

* More than half the country in sight covered with snow. † See Meteorological Observer's Handbook M.O. 191, p.50 (1926 edition).

Standard of Time. Observations should be made at 9 a.m. Local Mean Time (L.M.T.). Observers should consult the Meteorological Observer's Handbook, 1926 edition, p. 6, to obtain the Greenwich Mean Time (G.M.T.) which is equivalent to 9 a.m. L.M.T.
Observations should be made 1 hour later by the Railway or Post Office clock when Summer Time begins, *i.e.*, the Greenwich Time of observation is unchanged. Both G.M.T. and clock time should be entered at the top of the other side of this form.

Temperature. Max. and Min. temperatures are to be given to the nearest whole degree. When the maximum and minimum thermometers are read and set in the morning, the reading of the maximum thermometer must be entered to the previous day, that of the minimum to the day of reading. The highest and lowest maximum and the highest and lowest minimum should be underlined. The grass minimum should be read at 9 h. It should be taken in during the day and put out in the late afternoon.

Weather Summary. Enter a zero when there are no occasions of a phenomenon, and a dash — when there is no information.

Rainfall. If measured in the morning enter to the previous day in column 23.
Always express a rainfall measurement by two figures at least (inserting zeros where necessary to effect this), and see that the position of the decimal point is correct, *e.g.*—

Millimetre measurements 0·7, 7·0, 8·7, 24·3.
Inch measurements ·01, ·11, 1·10.

Three figures are required only when the measurement exceeds 9·9 mm. or ·99 inch.
When there has been no precipitation the entry in column 23 should be a dash — (not ·00). The entry "trace" or "tr." is to be made in the two following cases, (A) and (B).

(A) When there is less than ·005 inch or ·05 mm. of water in the gauge and the observer knows that this is not the result of a drop or two draining from the sides of the can after emptying the rainwater out of it at a previous time of observation, *i.e.*, the observer must be reasonably certain that there has actually been precipitation since the preceding measurement. If the observer knows that the precipitation has been in the form of dew or wet fog this may be noted in the remarks column.

(B) The observer knows definitely from his own observation that some rain (or other form of precipitation such as snow, hail, sleet or drizzle) has fallen since the preceding observation, and yet finds no water in the gauge. This happens sometimes especially in dry, warm weather, without the gauge being even damp, the small amount of rain having evaporated before it got into the receiving can.

P2765, P528B-2275, 3000, 8/29, Malby & Sons, Photo-Litho.

FORM No. A173/T.G.
(Pink.)

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

MONTHLY DIARY.

AGRICULTURAL CROP OBSERVATIONS.

(See Observers' Handbook, Section III. 1, par. 6.)

STATION_____ MONTH_____ 192__

1st

2nd

&c.

31st

(*Signed*) _____
(*Observer.*)

The Diary should be prepared in duplicate. One copy retained by the Station and the other forwarded to the Ministry of Agriculture, 10, Whitehall Place, London, S.W.1.

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM FOR RECORDING HORTICULTURAL OBSERVATIONS. (APPLE).

HORTICULTURAL CROP OBSERVATIONS. 19 .

STATION _____ OBSERVER (Signed) _____

APPLE (WORCESTER AND BRAMLEY'S SEEDLING)

Stock
Age

Plot Characteristics:

Altitude _____ ft. Aspect _____ Topography of surrounding area _____

Air currents _____

Description and mechanical analysis of soil and sub-soil _____

Cultural:

Methods of tillage _____

Dates of Spraying (if any) _____

	Worcester Pearmain.	Bramley's seedling.
1. Date of (a) First open flower		
(b) Full blossom (50% of flowers in blossom).		
(c) Dropping of petals of last flower.		
2. Observer's note on character and duration of blooming season.		
3. Number of blossom trusses (or general observations on quantity of blossom).		
4. General observations on extent of set of fruit.		
5. Date of June drop and general observations on extent of drop.		
6. " on which the bulk of the fruit is ripe.		
7a. Crop from each tree and total crop gathered, not including June drop, with note of accidental losses.		
7b. Total weight of droppings, not including June drop.		
8. Note on keeping qualities of fruit.		
9. Diseases and pests (Character, date of appearance etc.) *		
10. Duration of defoliation period and colour of foliage during this period.		

11. Shoot growth. Measurement in cms. of each of the three principal leaders of the four trees, monthly from 1st May until defoliation. The same leaders to be measured throughout the season.

Tree No.	Leader No.	1. May	1. June	1. July	1. Aug.	1. Sept.	1. Oct.	1. Nov.	1. May	1. June	1. July	1. Aug.	1 Sep.	1 Oct.	1 Nov.
1	1														
	2														
	3														
2	1														
	2														
	3														
3	1														
	2														
	3														
4	1														
	2														
	3														

*The presence of every pest affecting growth and yield must, if possible, be detected and its effect estimated.

C&P Ltd W.C. P528C-3000-6/29/(172)

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM FOR RECORDING HORTICULTURAL OBSERVATIONS. (PLUM).

HORTICULTURAL CROP OBSERVATIONS. 19 .

STATION_____ OBSERVER (Signed)_____

PLUM
(VICTORIA).
Stock. Brussel.
Age

Plot Characteristics:
Cultural:

(Altitude_____ ft: Aspect_____ Topography of surrounding area_____
Air currents_____
Description and mechanical analysis of soil and sub-soil._____
Methods of tillage._____
Dates of Spraying (if any)._____

1. Date of (a) First open flower.
 (b) Full Blossom (50% of flowers in blossom)
 (c) Dropping of petals of last flower.
2. Observers note on character and duration of blooming season.
3. Number of blossom trusses (or general observations on quantity of blossom)
4. General observations on extent of set of fruit.
5. Date of June drop and general observations on extent of drop.
6. " on which the bulk of the fruit is ripe.
7a. Crop from each tree and total crop gathered, not including June drop, with note of accidental losses.
7b. Total weight of droppings, not including June drop.
8. Diseases and pests (character, date of appearance etc.)*

*The presence of every pest affecting growth and yield must, if possible, be detected and its effect estimated.

C&R.LTD.N&PS&C-3000-8/29(178).

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM FOR RECORDING HORTICULTURAL OBSERVATIONS. (BLACK CURRANT).

HORTICULTURAL CROP OBSERVATIONS. 19

STATION _____ OBSERVER (Signed) _____

BLACK-CURRANT. Plot Characteristics: (Altitude _____ ft: Aspect _____ Topography of surrounding area

Air currents _____

(BOSKOOP GIANT). Age (Description and mechanical analysis of soil and sub-soil _____

Cultural (Methods of tillage _____

(Dates of Spraying (if any) _____

Origin of Stock.

1. Blossom (a) Date when first basal flower of raceme is out.
 (b) Date when final apical flower of the same raceme is out.
2. Set of crop: General observations on extent of running off.
3. Date when all currants are fully ripe.
4. Crop from each bush and total weight of fully ripe currants.
5. Duration of defoliation period.
6. Number of Big Buds† on each bush during first week in January.
7. Diseases and pests (character, date of appearance etc.)*

†NOTE:- All Big Buds should be picked off and destroyed.

*The presence of every pest affecting growth and yield must, if possible, be detected and its effect estimated.

CARLTON PS28C-3000-829/1(2)

MINISTRY OF AGRICULTURE AND FISHERIES,

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM FOR RECORDING PHENOLOGICAL OBSERVATIONS (SHORT LIST).

Phenological Observations 19 ___ January to December.

(Short List).

Station

Date of Flowering etc.		Plants.	Remarks.
	x ♂	Hazel (Corylus avellana)	
		Common Elm (Elmus campestris)	
	x ♂	Coltsfoot (Tussilago farfara)	
	x ♂	Blackthorn or Sloe (Prunus spinosa)	
	♂	Horse Chestnut (Aesculus hippocastanum) (Leafing)	
	x	Garlic Hedge Mustard or Jack by the Hedge (Alliaria officinalis or Sisymbrium alliaria)	
	♂	Ash (Fraxinus excelsior)	
		Germander Speedwell or Birds' Eye, (Veronica chamaedrys).	
	x ♂	Horse Chestnut (Aesculus hippocastanum) (Flowering)	
	x ♂	Hawthorn, May or Whitethorn (Crataegus oxyacantha)	
	♂	Elder (Sambucus nigra)	
	x ♂	Oxeye Daisy or Dog Daisy (Chrysanthemum leucanthemum)	
		Herb Robert (Geranium robertianum)	
	x	Wild (Dog) Rose (Pink) (Rosa canina)	
	x	Black Knapweed or Hardhead (Centaurea nigra)	
	x	Greater Convolvulus or Greater Bindweed (Convolvulus sepium)	
		Tansy (Tenacetum vulgare)	
		Lime (Tilia europaea) (Fall of fruiting bracts)	
	♂	Horse chestnut (Aesculus hippocastanum) (First fall of fruit)	
	x ♂	Ivy (Hedera helix) (Flower)	
	♂	Horse Chestnut (Aesculus hippocastanum) (First detection of colour change)	

Notes (1) x Indicates plants on the Royal Meteorological Society's List.
(2) ♂ " " " " European List.
(3) Where nothing to the contrary is stated the flowering is to be noted.
(4) When the observation is made on plants not on the selected farm or station, a note to this effect should be made by the observer.
(5) Trees. Where several observations are asked for (e.g. Horse Chestnut) they should be confined to the same tree.
(6) Hazel. The female flowers only are to be observed. They are little bright red flowers, which as a rule open directly after the male flowers or catkins.
(7) Blackthorn. Care should be taken to distinguish the normal Prunus spinosa from the earlier small flowered forms and from the Wild Bullace.
(8) Garlic Hedge Mustard - a white crucifer, root leaves large, thin, orbicular. Flower stems one to two feet high.
(9) Ivy. The wild form and not a garden variety should be selected and observations confined to the same plant each year.

Signed
Observer

Form No. A.237/T.G.

C&RLPOW T.P.526C - 3000 - 8'29(172)

FORM No. A172/T.G.
(Buff.)

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

MONTHLY DIARY.

HORTICULTURAL CROP OBSERVATIONS.

(See Observers' Handbook, Section IV., par. 6.)

STATION_____ MONTH_____ 192__

1st

2nd

&c.

31st

(*Signed*)_____
(*Observer.*)

The Diary should be prepared in duplicate. One copy retained by the Station and the other forwarded to the Ministry of Agriculture, 10, Whitehall Place, London, S.W.1.

MINISTRY OF AGRICULTURE AND FISHERIES,

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM FOR RECORDING PHENOLOGICAL OBSERVATIONS (SHORT LIST).

Phenological Observations 19 January to December.

(Short List).

Station.....

Date of Flowering etc.	Plants.	Remarks.
	x ♁ Hazel (Corylus avellana)	
	Common Elm (Elmus campestris)	
	x ♁ Coltsfoot (Tussilago farfara)	
	x ♁ Blackthorn or Sloe (Prunus spinosa)	
	♁ Horse Chestnut (Aesculus hippocastanum) (Leafing)	
	x Garlic Hedge Mustard or Jack by the Hedge (Alliaria officinalis or Sisymbrium alliaria)	
	♁ Ash (Fraxinus excelsior)	
	Germander Speedwell or Birds' Eye, (Veronica chamaedrys).	
	x ♁ Horse Chestnut (Aesculus hippocastanum) (Flowering)	
	x ♁ Hawthorn, May or Whitethorn (Crataegus oxyacantha)	
	♁ Elder Sambucus nigra)	
	x ♁ Oxeye Daisy or Dog Daisy (Chrysanthemum leucanthemum)	
	Herb Robert (Geranium robertianum)	
	x Wild (Dog) Rose (Pink) (Rosa canina)	
	x Black Knapweed or Hardhead (Centaurea nigra)	
	x Greater Convolvulus or Greater Bindweed (Convolvulus sepium)	
	Tansy (Tenacetum vulgare)	
	Lime (Tilia europaea) (Fall of fruiting bracts)	
	♁ Horse chestnut (Aesculus hippocastanum) (First fall of fruit)	
	x ♁ Ivy (Hedera helix) (Flower)	
	♁ Horse Chestnut (Aesculus hippocastanum) (First detection of colour change)	

Notes
(1) x Indicates plants on the Royal Meteorological Society's List.
(2) ♁ " " " " European List.
(3) Where nothing to the contrary is stated the flowering is to be noted.
(4) When the observation is made on plants not on the selected farm or station, a note to this effect should be made by the observer.
(5) Trees. Where several observations are asked for (e.g. Horse Chestnut) they should be confined to the same tree.
(6) Hazel. The female flowers only are to be observed. They are little bright red flowers, which as a rule open directly after the male flowers or catkins.
(7) Blackthorn. Care should be taken to distinguish the normal Prunus spinosa from the earlier small flowered forms and from the Wild Bullace.
(8) Garlic Hedge Mustard - a white crucifer, root leaves large, thin, orbicular. Flower stems one to two feet high.
(9) Ivy. The wild form and not a garden variety should be selected and observations confined to the same plant each year.

Signed.....
Observer

Form No. A.237/T.G.

CHARLTON P.528C-3000-6'29(172)

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM FOR RECORDING PHENOLOGICAL OBSERVATIONS. (PHENOLOGICAL GARDENS) 19 .

Station Approximate height of garden above sea level feet.

Plants.	Date of flowering.	Remarks.
Christmas Rose, White. (Helleborus niger)		
Mezereon. Red form (Daphne Mezereum).		
Snowdrop (Galanthus nivalis).		
Yellow Crocus (Crocus aureus).		
Lesser Celandine. (Ranunculus Ficaria)		
Wood Anemone (Anemone nemorosa)		
Lilac (Syringa vulgaris)		
Bird Cherry. (Prunus Padus)		
Woodruff (Asperula odorata)		
Broom (Cytisus Andreanus)		
Ox-eye Daisy (Chrysanthemum Leucanthemum)		
Honeysuckle or Woodbine (Lonicera Periclymenum)		
Elder (Sambucus nigra)		
Wild (Dog) Rose, (Pink) (Rosa Canina)		
Privet (Ligustrum vulgare)		
Black Knapweed (Centaurea nigra)		
Devil's-Bit Scabious (Scabiosa Succisa)		
Tansy (Tanacetum vulgare)		
Chrysanthemum, White. (Cedo Nulli)		
Autumn Crocus (Colchicum autumnale)		

	*First Leafing.	*Leafless.	Remarks.
Mezereon, Red form (Daphne Mezereum)			
Wild (Dog) Rose, (Pink) (Rosa Canina)			
Lilac (Syringa vulgaris)			
Bird Cherry (Prunus Padus)			

*The "leaf" observations are not essential, but it is hoped that observers will endeavour to note as many of them as possible.

C&A(M) W.F.P. 628C-3000-8/29(172)

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

FORM FOR RECORDING PHENOLOGICAL OBSERVATIONS (WALES).

Year _____

Centre _____ General description of Centre _____

Particulars to be recorded.	Details of Situation. (Elevation, aspect, shady or exposed, hedge row, open field, thicket, wood, or roadside).	Date of First leafing.	Date of Flowering. Commencement.	Date of Flowering. Zenith.	Date of Fruit ripe.
Honeysuckle or Woodbine Lonicera periclymenum) First leafing					
Wild (Dog) Rose (pink) (Rosa Canina) " "					
Hazel (Corylus avellana) (Red female flowers). Flowering					
Lesser Celandine (Ranunculus ficaria) "					
Coltsfoot (Tussilago farfara) "					
Wood Anemone (Anemone nemorosa) "					
Blackthorn or Sloe (Prunus spinosa) "					
Hawthorn, May or Whitethorn (Crataegus Oxyacantha) "					
Woodruff (Asperula odorata) "					
Ox-eye Daisy (Chrysanthemum leucanthemum) "					
Honeysuckle or Woodbine (Lonicera periclymenum) "					
Wild (Dog) Rose (pink) (Rosa canina) "					
Germander or Wood Sage (Teucrium Scorodinia) "					
Black Knapweed or Hardhead (Centaurea nigra) "					
Hawthorn, May or Whitethorn (Crataegus oxyacantha) Fruit ripe					
Wild(Dog) Rose (pink) (Rosa canina)					
Swallow First seen					
Cuckoo First heard					
Garden White Butterfly (pieris rapa) First seen					

		Earliest Date.	Average Date.	Latest Date.	Crop (Heavy or Light)
Lambing					
Cattle	Turning out to grass				
Oats (Variety or Breed)	Sowing				
Swedes (Variety or Breed)	"				
Hay	Cutting				
Hay	Carrying				
Oats	Cutting				
Oats	Carrying				
Cattle	Wintering				

Other Observations:-

_____ Observer.

C&R LTD W&P 528C-3000-8'29(.72).

FORM No. A176/T.G.
(Blue.)

MINISTRY OF AGRICULTURE AND FISHERIES.

AGRICULTURAL METEOROLOGICAL SCHEME.

MONTHLY SUMMARY OF DIARIES.

(See Observers' Handbook, Section VI.)

STATION_____ MONTH_____ 192___

NOTE.—Strike out those headings which are not applicable to the work undertaken by the Station in connection with the Scheme.

Weather
and
General.

Wheat.

Oats.

Barley.

[P.T.O.

Roots.

Grass.

Fruit
(and Peas).

Diseases
and Pests.

Phenological
Observations.

Other
Observations.

(*Signed*)_____
Observer

The Summary should be prepared in duplicate. One Copy retained by the Station and the other forwarded to the Ministry of Agriculture, 10, Whitehall Place, London, S.W.1.

PUBLICATIONS ARISING OUT OF THE IMPERIAL AGRICULTURAL RESEARCH CONFERENCE, 1927.

Report and Summary of Proceedings. Price 1*s.*; with postage 1*s.* 5*d.* Obtainable from the sale offices of His Majesty's Stationery Office, or from the Office of the Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

Contains a full account of the events leading up to the Conference, the recommendations made, and the views expressed by the highest authorities in agriculture in all quarters of the Empire. 250 pages.

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